ASSESSMENT OF OCCLUSAL FISSURE MORPHOLOGY IN DECIDUOUS MOLAR TEETH

Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

In Partial Fulfillment for the Degree of

MASTER OF DENTAL SURGERY

BRANCH VIII

PAEDODONTICS AND PREVENTIVE DENTISTRY

APRIL 2017

THE TAMILNADU Dr. M.G.R MEDICAL UNIVERSITY CHENNAI

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled "**ASSESSMENT OF OCCLUSAL FISSURE MORPHOLOGY IN DECIDUOUS MOLAR TEETH** "is a bonafide and genuine research work carried out by me under the guidance of **Dr. M. Jayanthi, M.D.S.,** Professor and Head, Department of Paedodontics and Preventive Dentistry, Ragas Dental College and Hospital, Chennai.

Dr. K. DEEBIGA
Post Graduate Student
Department of Paedodontics and
Preventive Dentistry,
Ragas Dental College & Hospital,
Chennai.

Date: 22/12/16

Place: Chennai

CERTIFICATE

This is to certify that this dissertation titled **"ASSESSMENT OF OCCLUSAL FISSURE MORPHOLOGY IN DECIDUOUS MOLAR TEETH"** is a bonafide record of work done by **Dr.K.Deebiga,** under my guidance during her postgraduate study period between **2014-2017**.

This dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY**, in partial fulfillment for the degree of **Master of Dental Surgery in Branch VIII – Paedodontics and Preventive Dentistry**. It has not been submitted (partially or fully) for the award of any other degree or diploma.

Guided by:

RAGAS DENTAL COLLEGE Chennai

Dr. M. Jayanthi, M.D.S.,

Professor and Head
Department of Paedodontics &
Preventive Dentistry,
Ragas Dental College & Hospital,
Chennai

Dr.Nilaya Reddy, M.D.S, DNB,

Professor
Department of Paedodontics &
Preventive Dentistry,
Ragas Dental College & Hospital,
Chennai

Dr. N.S. AZHAGARASAN, M.D.S.,

Principal
Ragas Dental College & Hospital,
Chennai

PRINCIPAL
RAGAS DENTAL COLLEGE AND HOSPITAL
UTHANDI, CHENNAI-600 119.

DATE : 22/12/16

PLACE : CHENNAI

ACKNOWLEDGEMENT

'Words are mere aggregation of alphabets, until and unless it originates from the bottom of the heart with genuineness, evading the rationalising ability of the brain.'

Keeping the above mentioned statement in mind, I would like to holeheartedly, thank few people whose presence at various points of time in my life, have ade me what I am today.

I would like to thank ***Almighty****, for having blessed me with conducive environment, throughout my life. My greatest boon, for having born to my parents, getting trained from eminent, skillful, highly knowledgeable teachers, who were highly gracious enough to impart me with their valuable possession of knowledge and skill.*

I would like to take this opportunity to thank my Guru, Guide and Head of the Department, ***Professor Dr. M. Jayanthi, M.D.S.,*** *for her constant support and intellectual inputs through out my post-graduation period. It was the initial belief that she bestowed upon me when we started the study, which kept me motivated and urged me to complete this dissertation, within the stipulated time frame. Her constant reassurance, and valuable guidance regarding the nuances of the art paediatric dentistry, helped me to learn the art of child management and successfully execute the same with impeccable precision and predictability. I would never forget, the interest and steps she*

had taken to ensure, that I completely understand. I have been inspired by her depth of knowledge, clarity of surgical plan, immense surgical skill in executing the same, prioritizing perfection both in planning and action. Madam, these three years of my postgraduation period under your mentorship and guidance, will be the most enchanting, enriching and enlightening period of my life. I owe you a lot Madam.

I would like to extend my gratitude to ***Professor Dr Nilaya Reddy, M.D.S.,*** *who has been a great trainer, philosopher to me during the three years of my fruitful postgraduate study period. Her constant, persisting quest for surgical and academic innovation and excellence , has activated an entire area of dormant grey matter in my brain .I have been awestruck , by her confidence, speed and precision of surgical work. I would like to personally thank her, for guiding me, and patiently instructing me while remaining besides me throughout three years of clinical procedures .I have been inspired by her unconventional, unorthodox style of thinking and execution. Apart from the, academic knowledge that Madam has imparted upon me, I have learnt from her, the way of dealing with problems or difficulties by facing them head on and management of adverse situations in appropriate manner. Madam, I will always remain indebted to you Madam.*

I would like to convey my heartfelt gratitude to our beloved Principal, ***Professor Dr. N.S. Azhagarasan, M.D.S.,*** *for believing in us and allowing us to use the scientific literature and research facilities of the college.*

*I am bounded to thank **Reader Dr Vijaya Praba**, for showing her interest and guidance all throughout my postgraduate period, with a benevolent heart. Her constant reassurance, words of wisdom, loving and caring nature were a great support at every step and moment during these three years, and this will be remembered all my life.*

*I would like to take the opportunity to whole-heartedly thank **Reader Dr Sakthivel** for his invaluable and prompt guidance, enlighting discussions, and constant support throughout my postgraduate life. I also thank him for teaching me the abstract features of esthetics, precise nature of rotary system and perfection in root canal treatment, be it in the field esthetics dentistry.*

*I would like to thank, **Reader Dr Poornima**, for sharing with me her deep knowledge and teaching me the essence of medical science in terms of assessing and handling a patient. I thank her for the enthusiasm, constant support that she had extended throughout my postgraduate course, especially lending a helping hand when ever I struggled. She has always showed belief in me and reassured my abilities in dealing with tough, new challenges in my life.*

*I don't have words to express my heartfelt thanks to **Dr Arun .E** Senior Lecturers, for always encouraging me and providing a conducive learning and knowledge sharing experience in the department. I would genuinely thank sir for teaching me the pathway for child management and also the tricks to excel good in academics. You are a great role model for me sir.*

I would like to thank, ***Dr. Radhika Krishnan,*** *Anaesthesiologist for sharing with me her deep knowledge and teaching me the essence of medical science in terms of general anaesthesia and handling patient .I thank her for the enthusiasm, constant support that she has extended throughout my postgraduate course.*

It would be a crime on my part, if I ignore ***Dr. Uma Devi*** *for being a constant source of knowledge, wisdom, encouragement. I would like to specifically thank* ***Dr. Kavitha wilson*** *for answering all my doubts both subject and otherwise, during the entire duration my dissertation. Madams, I owe you a lot.*

I would like to genuinely thank my seniors ***Dr. Madhan, Dr. Porselvi, Dr. Lakshmi*** *and* ***Dr. Rama devi*** *for teaching me various aspects of oral surgery, from their perspective.*

I would like to thank my batch mate precisely unborn sister ***Dr. Bhuvanesswari*** *for providing a healthy and competitive learning atmosphere through out my postgraduate learning period.*

I would also like to acknowledge and thank my juniors, ***Dr. Devichandrika , Dr.Keerthi, Dr.Gayathri*** *and* ***Dr.Akila***

I would also like to mention the constant selfless help offered to me by ***Dr .Sandhya*** *throughout the entire duration of my postgraduate period .*

I would be failing in my duty, if I don't thank ***Dr ELIZABETH****, Principal, Sree Mookambika institute of dental science and* ***Dr.ARUNIMA P.R,*** *for teaching me invaluable lessons in my undergraduate, I am pleased to be her student.*

I would like to acknowledge the constant support rendered to me by non-teaching staffs- Sister Eshawari, Sister Veni, Brother Venugopal and others, at our department, during the three year post graduate period.

I would be failing in my duty, if don't acknowledge the constant and timely support of ***Mr Thavamani*** *and* ***Ms. Sudha****, in compiling and printing my dissertation work.*

I would like to extend my gratitude to all those who directly or indirectly, helped me in completing this dissertation to the best of my ability, within time, without compromising the quality of dissertation.

As I have reserved the best for the last, I am nowhere without my ***parents Mr K.Karunakaran*** *and* ***Mrs Anithakaruanakaran*** *and my late grandfathers and grandmother* ***Mr. Kattiyakaran****,* ***Mr. Muthunayagam*** *and* ***Mrs. Lilly*** *and my grandmother* ***Mrs. Vellaiammal*** *Words cannot express the magnitude of things that, I owe them. I dedicate this dissertation to my parents and grandfathers and grandmothers. The stage that I have reached now, is primarily because of my parents who believed in my abilities, inspite*

of numerous failures in my life. They have always given me the best, often beyond their abilities. I considered myself fortunate to have been born to them.

‘ Jai Hind ! ’

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ABSTRACT

Aim:

To study the complex anatomy of the pit and fissure system of human primary first and second molar teeth under stereomicroscope.

Background:

The pit and fissure patterns on the occlusal surface of the human teeth represent vulnerable sites for initiation of dental caries due to their morphological complexity. However the decision making for sealants is based on the personnel, tooth and surface at risk. Hence it is important to understand the pit and fissure patterns in the application of appropriate preventive measures.

Materials and methodology:

100 Maxillary and mandibular first and second primary molars were collected and stored in neutral 10% formalin, cleaned with slurry of pumice and water. The teeth were sectioned longitudinally (buccolingually), thickness ranging from 40µm to100µm with the help of carborundum disc. The ground sections of the teeth were fixed on the glass slide and examined under stereomicroscope with 10 X magnification for the fissure pattern . The results were tabulated and analyzed.

Results:

The U-TYPE (56%) of fissure pattern was more prevalent in both the maxillary and the mandibular molar teeth followed by V –TYPE (37%) of fissure pattern.

Conclusion:

The U and V types of fissure patterns were predominantly seen in the primary molars compared to the other fissure patterns.

KEY WORDS:

PITS AND FISSURES, U- TYPE AND V – TYPE OF FISSURE PATTERN IN PRIMARY MOLARS, OCCLUSAL SURFACE OF PRIMARY MOLARS.

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

LIST OF FIGURES

LIST OF ANNEXURES

S.NO	TITLE
I	INSTITUTIONAL REVIEW BOARD APPROVAL CERTIFICATE

Introduction

INTRODUCTION

Caries process involves a large number of interrelating factors affecting the tooth with changes in the environment. Literature shows that pits and fissures are areas which are more susceptible to carious attack compared to the smooth surfaces.

Kraus Jordan and Abrams 1969 defined "A fissure is a cleft or crevice in a tooth surface thought to result from the imperfect fusion of the enamel of adjoining cusp or lobes" and "A pit is a sharp pointed depression usually located at the junction of 2 or more intersecting developmental grooves.[1]

The researchers have all investigated the patterns of the occlusal surface of the teeth and explained the fissure pattern through their drawing as the invagination extending from the occlusal surface to the enamel and sometimes into the dentin which are quite common and these teeth also have areas at the base of pits and fissure where there is little enamel covering the dentin. The presence of deep invagination of the enamel is thought by many to be an important predisposing factor because decay often starts in pits and fissure. More over many clinical studies have demonstrated the susceptibility of these areas to caries and tooth type in the dentition has its own specific occlusal surface anatomy, and caries is usually always detected in relation to

the same specific anatomical configuration in identical tooth types (Brekhus 1931, McCall 1934, Prime 1937, Brucker 1944, Paynter and Grainger 1962).[2-6.]

The pit and fissures in both primary and permanent dentition are areas which are highly liable to decay and act as a reservoir for the initiation and progression of the disease. The anatomy of pit and fissures of the teeth have been a subject of research as the recent trends focus more on prevention.

In the 1970s research had focused on prevention of occlusal caries and as a result the number and intensity of caries involving pits and fissure and smooth surface have decreased. 80% of all carious lesions in young permanent teeth involve a fissure surface which makes up 13% of total tooth surface.[7]

Prevention of pit and fissure caries has progressed from early treatment modalities like, mechanical fissure eradication and chemical treatment using silver nitrate to the development of more innovative and progressive materials and methods, such as micromechanical bonding of artificial resins to enamel substrate using acid etching techniques. The introduction of materials designed to seal pits and fissures so as to eliminate them as stagnation sites for microbial fermentation is a promising adjunct to existing measures. A contemporary approach for sealant placement includes an assessment of teeth

judged ‘AT RISK FOR CARIES ‘and not necessarily directed to all teeth with deep pits and fissures.[8]

The fissure patterns in the primary teeth was described by Mortimer (1970) as U and V type.[9] The permanent teeth fissure patterns were described by Nagano and Gustafson found that the prevalence of V- type was 34 %, IK-type 26 %, I- type 19 %, U- type 14 % and other as 7 %. Nagona also observed the relation between the localization of the primary carious lesion and form and depth of the fissure and he revealed that caries starts from the bottom in V type, it starts halfway down in the U- type, and from the top in the I-type and IK- type. A deep, narrow fissure may resist carious progression by hindering the impaction or even diffusion of considerable amounts of substrate which seems to be less liable to carious attack than one providing some space for plaque and debris to accumulate. Steepness of walls and ample space for retention above the entrance to the fissure appear to be the most important feature, with the depth of the fissure proper, being of secondary significance.[10,11] It is therefore mandatory to know about the pits and fissure patterns to preserve the teeth.

The morphology of fissures and their relationship to enamel caries in permanent teeth have been investigated by many authors under ordinary light, polarized light and microradiography.[12] However the literature related to

deciduous tooth fissures pattern and its relationship to caries is scarce. Hence this study was aimed to investigate the pit and fissure pattern in the deciduous teeth using stereomicroscope.

Aims & Objectives

AIM AND OBJECTIVES

1. To evaluate the fissure morphology in the deciduous maxillary and mandibular first and second molar teeth.

Review of Literature

REVIEW OF LITERATURE

Profitable investigations in relation to caries of pits and fissures were made when scientific observations on teeth first started. John Hunter wrote his book "Practical Treatise of the Disease of Teeth" in 1778 in which he mentioned that fissures are cracks or the hollow path of grinding surfaces of molars filled with black substance.[13]

Fox, writing in 1803, described fissures as irregularities of the grinding surface of the molars which leads into a cavity in the center of the tooth. The chief predisposition to decay is defective formation in either enamel or bony parts of teeth.[14]

W. Robertson (1835) in his book "A Practical Treatise on the Human Teeth" described the presence of small openings on the occlusal surface which leads to large cavities. He also drew attention to the shape and form which increases the liability of the tooth to decay. He tried to describe the etiology of caries in relation to the form of teeth. His observation on occlusal surfaces and on pits and fissures were remarkable in that he mentioned that the size and depth of fissures differ greatly and that "we rarely meet two molar teeth exactly alike" and also in his "Practical treatise of the diseases of the teeth "called attention to the fact that it is the shape and form of the tooth which increases the liability of the tooth to decay and also recognized that decay never occurred on clean, smooth surfaces and that the

attack on teeth was made at such points where food in retained. He reported that surface is often intersected with numerous smaller projections or ridges running transversely and in various directions and corresponding with an equal number of depressions, which constitute so many smaller cavities or deep pits, occasionally a fissure extends across the ridge of the mastication surface, and forms a cavity in the side of the teeth, in other cases the masticating surface presents three or four prominence around a deep pit in the centre. These indentations are in size, depth and number infinitely variable, so much so that we rarely meet with two molar teeth exactly alike, with the exception of the corresponding teeth of the same jaw, in which we always find a great similarity of structure He is considered the first writer to tell us that all decay is the result of chemical action and he believed that pits and fissures often found on teeth were the principal cause of their destruction.[15]

Goddard, (1843), spoke of fissures as original openings in enamel and that carious process is very rapid in them.[14]

Kelly, (1843), described decay as a process commencing in the body of the dentine of the tooth directly beneath the enamel, he even called it internal decay. He also attributes cause of tooth decay to the presence of deep fissures on bicuspids and molars.[14]

Baron Jones (1853) described decay as a process which affects teeth on opposite sides. This he attributes to the same morphology and the same environmental factors and considers decay occurs in pairs.[14]

James Truman (1870) quoted whether the filling of teeth be regarded as a subject already barren of interest, or a filed so thoroughly explored that no new result can be obtained, or still a theme open to further explanations, it cannot be denied that much more needs to be said to change bad practices if not bad theories. It is certainly astonishing that the progress in some directions had not kept pace with the great advances made ion others. This Category may be placed the knowledge and treatment of those depressions in teeth technically termed fissures .and advised treatment of depressions and that they should be given promptest attention and if there is a slight doubt the teeth should be given the benefit of the doubt and fissures must be filled.[16]

Magitot (1870) described fissures as congenital imperfections, where from vary infinitely and consist most commonly of vices of conformations of the enamel with large, dark, coloured, irregular grooves on the masticating face of molars and bicuspids. They have been considered "intrafollicular disturbances of their dentification".[17]

J.H. McQuillan, (1871) stressed that a fissure could extend from the bottom of the sulcus on the grinding surface of the tooth through the enamel and up to the dentine and end up in an oval shape cavity. He also suggested

that these fissures could be due to the result of defective formation and that enamel prisms have failed to coalesce at that point leading to the formation of the fissure and subsequently it's filling with food material. He considered the presence of fissures as an abnormal condition which must be treated.[18]

In **1871 Robert Arthur** published a book entitled "Treatment and Prevention of Decay of the Teeth" in which he claimed that the source of the agent causing decay, and contaminants at a point which form the lodgement and retention of particles in the mouth. He points to a rule by saying that wherever there is a defect in the continuity of the enamel of tooth decay is sure to occur , suggested that decay would not occur if the defective places could be obliterated by being filled with some substance capable of resisting the action of decomposing agents.[19]

Salter (1875) thought that defects between cusps of molars and premolars are common. Also that the fissures are deep and at their bottom exits only a "confused" developed enamel that is cracked and porous affording a most incomplete protection of the dentine from external influences. He also considered these depressions could happen on any unused tooth portion leading to the same results. He claimed that imperfectly formed enamel is more or less faulty in structure and this leads to decay. [20] This view was later supported by Andrews (1889).[14]

Andrews (1889) reviewed the literature of pits and fissures. He stated that pits and fissures are minute depressions extending from existing natural depression which separate the cusps of the molars .such sites he considered to be a predisposing cause of decay. Andrews mentioned pits and fissures are constantly present in the bicuspids as in molars differing with Black who found that pits were very often absent in bicuspids. He believed that fissures were found due to inherited tendencies although he was not sure of this opinion and claimed they could be caused by accidents subsequent to birth. Andrews also described an area of imperfectly developed dentine under a deep fissure and believed this to be the real cause of the formation of the fissure itself. He called such areas soft dentine, formed of imperfect global structures.[14]

Johnson (1898) considered fissures as structural imperfections by which the developing islands of calcification, beginning in the tips of the cusps, failed to properly unite on approaching each other, leaving a crack for the ingress of foreign matter.[21]

G.V Black (1897) in his book "dental anatomy "defined pits as sharp pointed depressions in the enamel. Pits occur mostly where several developmental grooves join as in the occlusal surface of molars and at the ending of the buccal grooves on the buccal surfaces of the molars. He defined fissures "as faults in the surface of teeth caused by the imperfect joining of

enamel of different lobes. Fissures occurs along the lines of the developmental grooves "Blacks extensive works in operative dental procedures are well known and they always included pits and fissures as sites of decay.[22]

Bodecker (1927) was also an advocate of the same theory of prophylactic odontotomy. A classification was made by bodecker into complete and incomplete fissures. Complete fissures were considered to be those which extend up to the dentine and incomplete fissures those which extend between the enamel and dentine and have a certain amount of enamel between them. Consequently with Hyatt and bodecker leading a vanguard of those interested in the prevention of caries, a new field was created in preventive dental procedures.[23]

Thaddeus P.Hyatt (1930) reported a review of literature on pits and fissures in the year 1853 Alfred Barron jones published a book entitled "observations on the diseases and loss of teeth" the corresponding teeth on opposite sides of the jaw are identical in structure. In the year 1871 JH Mc Quillan reported enamel prisms having failed to coalesce at that point and thus a condition is presented favourable to the retention of fluids and semi- solids, which undergo decomposition, would speedily destroy the thin septum of enamel covering the dentine. Tomes says from the natural depressions which separate the cusps of molars, minute but deep fissures may extended through the enamel to within short distance of the dentine, and they may become larger

as they recede from the surface of the tooth. Dr. J. Leon Williams took the position that "the predisposing causes of dental caries in the tooth are 1) shape or form 2) density or structure 3) reaction or vitality."[24]

Thaddeus P.Hyatt (1931) reported the new aspect of prophylactic odontotomy and suggested that 1) the acidity of the saliva is nerve sufficiently strong to cause decay. 2) Decay does not start from within the tooth and work outward. 3) the undisturbed retention of food debris creates a condition favourable to caries development 4) For caries to progress in dentin, there must be an opening to the surface 5) there is a distinct difference between the progress of decay in enamel defects.6) The structure of the tooth governs the rate of progress of decay but does not affect the liability to decay. And also reported that the crown form of the tooth develops from certain definite primary lobes which unite in a variety of combination to from the different teeth. The differentiation in terminology between coalescing surfaces and developmental lines is used for the following reasons : 1 A line has length without breadth 2 A surface is a plane which has both length and breadth . There for coalescing surfaces. Having both length and breadth cannot be classed ad lines. Thus, we have the developmental lines as the external indication of the fusion of the primary lobes. These external evidences of union, or what are called developmental lines, vary in number in the different teeth in direct proportion to the number and arrangement of the primary lobes.

Often, we find that some one of these variable factors has failed to perform its normal function, and along the developmental line there is an imperfect coalescence, leaving what is technically called pits and fissure.[25]

Walter and Bossert (1933) conducted a study to check the relationship between the shape of the occlusal surfaces of molars and the prevalence of decay in the year 1933.Measurements made with Stantonsurveyer of upper right first permanent molars of 7 to 25 years group people to access the relation between cuspal angulation and the caries liability at pits and fissures . The highest portion, or upper extremity of mesio – lingual cusp to the mesio –buccal cusp. Distance and was measured as X, Y, Z, M of 100 teeth 38 – had caries in the central pit and 62 – were non carious tooth. The study result shows that steeper the sides of the cusp, the greater the likelihood of caries in the pit.[26]

Brucker (1944) reviewed the relation between the caries and fissures and presented evidence not in favour of the prophylactic odontotomy that is against concept by hyatt and bodecker.[27]

Grainger R.M et al (1959) conducted a study to check the difference in the morphology and size of the teeth of a caries – susceptible and a caries – resistant strain of rats . The basic morphologic pattern of the teeth in human beings and in animals is apparently determined by a genetic mechanism this present study was therefore, set up to try to measure differences in

morphology and size of molar teeth in two groups of rats, one caries – susceptible and the other caries- resistant, which had been selectively bred on the basis of caries susceptibility in the laboratories. The upper right and upper left first molars were dissected from each head. The upper right molars were cemented to a stiff wire so that photographs could be made of the occlusal and lingual surfaces of each tooth. Standard enlargements were made from negatives on a non – shrink photographic paper. The magnification factor was 30 times the original tooth diameter. The left maxillary first molar was also cemented to a stiff wire, this time so that the lingual surfaces were positioned at right angles to the long axis of the wire. The photographs were used to measure both the depth and the mesio- occlusal fissure. The only correlation that approached significantly was the difference in the diameter of the crown and at the cervix, and the depth of the section fissure. The angle and the depth of the fissure appeared generally low that factor were believed to be separately associated with caries susceptibility in the animals.[28]

Grainger R.M et al (1959) conducted a study on a comparison between the width of the fissures of the lower molars of caries-resistant and caries-susceptible albino rats the importance of heredity in the development of dental caries has been demonstrated by Hunt and Hoppert. The lower molar teeth of a rat are characterised by deep, narrow, transverse fissures in which food may get become impacted. It seems probably that the lodgement of food

in such a depression facilitates the carious process. Difference in the width of fissures might therefore contribute to difference in resistance to caries. The object of this investigation was to determine whether the fissures of the susceptible rats differ significantly in width from the fissures of resistants. Resistant animals used in this excrement were produced from mattings of nineteenth generation resistant adults from Hunt's and Hoppert's experiments. Both groups of rats (susceptible and resistant) contained 24 females and 16 males at the begging of the investigation. Some fissures in the susceptible group were damaged by caries and secondary fracturing following the carious process. Since these fissures could not be accurately measured, they were not included in the study. In the resistant group the fissures of all the original 24 females and 16 males were measured. Factors which might conceivably, affect, or be correlated with, the widths of the fissures in the lower molar are: degree of resistance to dental caries, sex and the side (right or left) on which the tooth is located.[29]

Gillings and Buonocore (1961) conducted a study to check the pit and fissure pattern in the human molars and bicuspids and confirmed the presence of pit and fissure in human tooth as normal. A total of 40 – caries free upper and lower first and second molar and 12 – upper and lower bicuspids were assessed. Mesiodistal fissure was taken as a standard region for checking the fissure pattern. The sectioning was with a specialized technique – 'graphical

reconstruction'. Molars were made into 24 – sections per tooth and bicuspids 16- sections per tooth. Totally 1,312 sections were assessed. True enamel thickness, probe enamel thickness, ideal enamel thickness was checked. They confirmed the presence of deep invagination on the teeth surface sometimes dentin has been also exposed.[30]

Klaus G. Konig (1963) conducted a study to check the co relation between the dental morphology in relation to caries resistance with special reference to fissures as susceptible areas 12 human premolars. 140 non – decalcified serial sections were studied to see the relationship between morphology and early caries in the occlusal fissures. In all teeth, the initial lesions over the whole length of a fissure were small in shallow parts and comparatively well progressed in narrow parts with steep walls. In 24 highly susceptible OM and 24 relatively caries – resistance spd rats, the relationship between the frequency distribution of sulcal lesion in first and second lower molars and measurable morphologic characteristics in these teeth was investigated. In MO rats, the susceptible fissure was the shallowest one with the widest opening angle, a finding which corroborates the result from human teeth. Fissure almost as narrow and deep as in the susceptible MO rats – fissures, therefore which might be supposed to become decayed environment conditions favouring caries – are rather resistant to decay. On the other hand, caries – promoting morphologic trait appears to be present in these rats in a

step between occlusal level of the first and second molars. These steep favours the food entrapment. This study confirms the narrowness and the steepness of fissure walls apparently favours the onset of caries with favourable food entrapment surface.[12]

Birgit angmar, D. Carlstrom and J.E Glas (1963) conducted a study to see the ultrastructure of dental enamel, the mineralization pattern of normal permanent enamel of ten human incisors was studied with quantitative contact microradiography. And the technique was also described in detail. The general trend in the mineralization pattern consisted in a smooth decrease in the amount of mineral salts from the surface of the enamel towards the dentin enamel junction. This decrease varied considerably in individual samples, the extreme values being 0.7 and 4.4% mineral salts by weight. A simultaneous investigation with polarized light microscopy revealed no co relation between then birefringence and the mineral content. Permanent enamel was found to be non imbibable with immersion liquids other than water.[31]

Fusayama and kurosu (1964) conducted a study to access the accuracy of clinical by complaining with the finding of ground section in extracted 31- posterior tooth. Examination was done with naked eye and photograph were taken for diagnosis of the fissure, groves and pits. The same teeth were examined by longitudinal sectioning and tooth section replica was also made with celluloid amyllacitate, along with that the extension of fissure

was recorded by clinical examination of 4,887 teeth. The differential clinical diagnosis between fissures and grooves has been verified by histologic methods. A well – defined dark line establishes a fissure. A broader shadow indicates a groove. The same criteria serve to establish fissures and grooves which persist after attrition. The incidence of pits and fissures in developmental groove has been calculated. They concluded that well demarcated, defend dark lines as fissure, a board shallow indicates a groove ,no isolated pit on the buccal surface where as in lower molar on isolated pits were found on the lingual surface.[32]

Louis W.Ripa (1966) conducted a study to examine the histology of the early carious lesion in primary teeth with special reference to a prism less outer layer of primary enamel. Longitudinal polished ground sections, approximately 100µ thick, were prepared through 20 white spots lesions from the proximal enamel surface of primary teeth, embedded in Wards bioplastic and cut on a Gillinga – hamco thin section machine, lesion of permanent teeth were prepared similarly for comparison. And reported that the direction of the striae of Retzius appears to represent a major histologic difference between proximal white spot lesions of primary and permanent enamel. In the primary teeth the straie are more or less parallel to the surface as said by pickerills. The significant of this study was the existence of negatively birefringent, highly oriented, prism less outer layer of the primary enamel. Its occurrence in all

teeth examined strongly suggests it is a product of the terminals stage of amelogenesis and not acquired postoperatively.[33]

L.W. Rippa , A.J. Gwinnett and M.G. Buonocore(1966) conducted a study to examine the prismless outer layer deciduous and permanent enamel. The outer layer of enamel was made on longitudinal, undecalcified sections prepared from twenty eight erupted deciduous teeth, eighty - eight erupted and forty unerupted permanent teeth were examined by means of polarized light and phase contrast microscopy and microradiography. A layer of apparently prismless enamel was found on all the deciduous teeth and on 70 per cent of the permanent teeth. This layer, which averaged approximately 30µ in thickness, frequently showed surface parallel laminations and the crystallines with in the layers. For the twenty – eight deciduous teeth, the crystalline orientation of the prismsless differed from that of the underlying enamel.[34]

A.J. Gwinnett (1967) conducted a study to view the ultra-structure of the prismless enamel of permanent human teeth of fifteen permanent erupted human pre- molars was investigated by polarized light and electron micro radiography and X- ray diffraction analysis. The crystallites in the prismless enamel were arranged parallel to each other. The increase in the negative birefringence of this enamel compared to that underlying it was attributed partly to its parallel crystallite arrangement contrasting with the underlying enamel and partly to its increased mineralization deduced by

microradiography. Unlike its counterpart in the deciduous teeth only single arch.[35]

K.V. Mortimer (1970) conducted a study to check the relationship of deciduous enamel structure to dental diseases. 150 freshly extracted deciduous teeth from age group 15 months to 14 years and 40 exfoliated teeth were examined. The teeth were sliced with the section thickness between 25 µm - 100µm with microradiography. The images showed the thickness of the enamel of the deciduous teeth was much thinner than that found in the permanent teeth. Fissures caries predominate in the young teeth .older age group there was a predominance of interstitial lesions even though occlusal lesion were seen .Fissure seen in the deciduous molars teeth were shallower than those found in the molars of the permanent teeth.[9]

A. J Gwinnett and MG Buonocore (1972) conducted a study in a scanning electron microscope study of pit and fissure surfaces conditioned for adhesive sealing. The occlusal surfaces of twenty – five caries free, erupted, permanent human molariform teeth were checked. A modified 50% phosphoric acid solution was used to condition occlusal surface prior to the application of adhesive sealant. The extent to which this agent affects the occlusal sites of permanent molar and pre molar teeth was investigated using scanning electron microscope.[36]

Catherine L.Taylor and A John Gwinnett (1973) conducted a study to check the penetration of sealant into pits and fissure. The study sample was divided into four groups and three resin sealants were placed, the extended of the sealant filled the pits and fissures were checked and no change was found with the various cleaning methods. The fissures were also classified as wide V type, a narrow V type and a bottle neck configuration .This study confirmed that in tooth possible transition of a wide V to a narrow V to a bottle neck configuration. The wide V was the most common, where as the bottle was the least common.[37]

K.A. Galil and A.J. Gwinnett (1975) conducted a study by three dimensional replicas of pits and fissures in human teeth: scanning electron microscopy study. Eighty unerupted molars and premolars were surgically removed and stored in 10 percent neutral formalin vinyl resin replica was taken .The replicas were observed under the light microscope of replicas mounted for examination in the scanning electron microscope . The premolars were showing curved fissure with number of pits arising from it. Upper and lower molars the outline of the fissures was extremely variable. The most common were pointed, clubbed a rose headed.[38]

K.A. Galil and A.J. Gwinnett (1975) conducted the study to check the histology of fissures in human 193 unerupted teeth. The teeth were surgical extracted with intact follicle. Tooth sectioning were done and

subjected to either light or scanning electron microscope. The ameloblast were often directly in contact with enamel wall. Despite the narrow, constrictive confines of the pits and fissure sites, these cellular elements exist in a presumably viable state until or shortly after eruption. Their ultimately fate is unknown.[39]

Marianne juhl (1983) conducted a study in three dimensional replicas of pits and fissures morphology in human teeth where the replicas of pits and fissures from surgically removed unerupted human third molars and premolars, and from erupted premolars extracted for orthodontic reasons, were examined in the scanning electron microscope. The results confirm that the morphology on the occlusal surfaces of third molars is extremely variable with numerous pits of considerable length positioned at various angles relative to the fissures. In contrast, the morphology of unerupted and erupted premolars is simples with fewer and shorter pits positioned perpendicular to the fissure. It is pointed out that fine details of the morphology are lost when reconstruction of the occlusal morphology are made from serial ground section. However, such reconstructions seems to be less reliable in third molars than in premolars.[40]

Marianne juhl (1983) conducted a study to localize the carious lesion in occlusal pits and fissures of human premolars. The position of carious lesion in fissures of 50 maxillary premolars was studied in serial ground

sections in polarized light using air and various aqueous media for imbibition. Most frequently the carious lesion was localized in the lower part of fissures 61% .Multiple foci both in the upper and lower part were found in 36% of the fissure. Only 13% had carious lesions positioned above the entrance. No relationship was found between fissure and morphology and site of the carious lesion. However this study has confirmed that fissured areas are highly susceptible to caries in premolars.[41]

Shellis R P (1984) conducted a invitro study to determine the mean lesion depth in deciduous and permanent teeth by producing caries – like lesion in 21 human deciduous teeth and 18 permanent teeth by exposing the tooth to acidified hydroxymethyl – cellulose gel with gel with ph 4.5 for 21 days. The teeth after incubation was sectioned using A-S Hallswarth technique. The sections was examined through scanning electron microscope SEM. The negative of SEM photograph were projected at a constant magnification in an enlarged paper. The lesion depth was w more in deciduous teeth then the permanent teeth which was in accordance with the study by feartheson and mellberg and tyler et al. this study also hypothesised that there is difference in lesion formation between deciduous and permanent teeth.[42]

Kim Ekstrand V. Qvist A. Thylstrup (1987) conducted a study in light microscope study of the effect of probing in occlusal surfaces. The aim was whether tactile examination with an explorer may produce traumatic

defects in occlusal fissures. The study was carried out in 10 young male adults each of whom was due to have on pair of newly erupted third molars to be extracted. The teeth were sectioned a total 196 ground section were examined in a stereomicroscope .Results indicated that classical use of sharp explorers may produce irreversible traumatic defects in demineralised areas in occlusal fissures conditions for isolated lesion progression.[43]

J.C. CARVALHO, K.R. EKSTRAND, and **A. THYLSTRUP (1989)** conducted a study to check the occlusal surfaces of partly and fully erupted first right permanent molars were examined with respect to the occurrence and distribution of plaque and dental caries in a group of 57 six- to eight-year-old children. The children were classified into four groups ranging from one tooth partially erupted to full occlusion. Occlusal plaque was recorded at two levels of examination: (1) visible plaque and (2) detailed mapping by means of a plaque detector system. Dental caries was recorded after professional cleaning. The recording of plaque was repeated after 48hr without oral hygiene. The findings showed a significant reduction in the easily detectable plaque in fully erupted teeth, compared with the three groups representing partly erupted teeth. The detailed mapping of plaque showed a clear pattern of preferential locations related to the macro morphology of the occlusal surfaces, and revealed reduction in the frequency of thick plaque accumulation in the fully erupted teeth. The proportion of active lesions was reduced in fully erupted

teeth, and arrested lesions were mainly observed in the same group. This indicated that erupting teeth are more likely to develop dental caries, due to favourable conditions for plaque accumulation. Functional usage of teeth in addition to improved access for tooth brushing promoted arrestment of lesions initiated during eruption.[44]

John Brownhill et al (1990) investigated the treatment selection for fissures grooves of permanent molar teeth .Six permanent third molar teeth, with morphology similar to the first molar were chosen. These teeth were then evaluated by paediatric dentist and other dentists, for diagnosis and treatment strategies. It was found out that the paediatric dentist were more conservative in their approach, they used sealants. But all the other dentists were more radical, and when the fissure was opened up they found caries, which later was restored using amalgam /composite. They stated that if the fissures are non – carious, then they would be sealed and resealed ad needed. The authors felt that usage of radical and too conservative management techniques was unpopular.[45]

Ekstrand KR, Garlsen O, thylstrup (1991) conducted study to check the morphometric analysis of occlusal groove in mandibular third molar Based on serially cut 200-microns-thick sections from 21 human mandibular third molars, a quantitative characterization was made of the morphology in the mesial and distal interlobular groove. Two parameters were used: depth of

interlobular groove and structure angle. The interlobular groove depth varied between 0.13 and 0.55, taken in relation to the maximum crown height. The structure angle varied between 2 degrees and 170 degrees. If the structure angle was less than or equal to 25 degrees, the interlobular groove was classified as a fissure; if the angle was greater than 25 degrees, the interlobular groove was classified as a groove. Only in 18% of the sections did the interlobular groove manifest itself as a fissure. The study demonstrates that it was possible unambiguously to describe the two-dimensional profile of interlobular grooves by groove depth and structure angle.[46]

Lussi. a (1991) conducted a diagnostic study The purpose of this in vitro study was to test the accuracy and the reproducibility of diagnostic and treatment decisions of fissure caries with and without explorer. 34 dentists were asked to diagnose 61 teeth and decide upon possible treatment. The teeth were then histologically prepared and diagnosed. The agreement between histological and clinical diagnoses was assessed. The results showed no difference in diagnostic accuracy between explorer and visual technique only. Sensitivity (62%) and specificity (84%) showed that the dentists were more likely not to treat decayed teeth than to restore sound teeth. The percentage 'correctly diagnosed teeth' was approximately 42%. As there was an inherent possibility of a correct diagnosis by chance, this value had to be corrected to 23% (kappa statistics). The percentage of 'clinically' correct treatment

decisions, however, was 73%. The reproducibility test gave kappa values of 0.47 for diagnostic and 0.44 for treatment decisions. It was concluded that the use of an explorer does not improve the validity of the diagnosis of fissure caries when compared to that of a visual inspection alone.[47]

Jean R jasmin et al (1991) conducted a scanning electron microscopic study of the fitting surfaces of fissure sealants. After sealing 10 young permanent teeth with helioseal, they were immersed in 30 % nitric acid for 6 hrs to be dissolved and to obtain the sealant. The base of the sealant served as a replica of the base of the fissure. They were the seen under SEM. They found that even though the sealant penetrated deep into the fissure, they did not consistently reach the bottom of the fissures. All specimens exhibited bubbles and gaps of different sizes and shapes in the depth of the fissures. All cases showed tag formation at the slopes and upper part of the fissures, but tag formation was absent at the base of the fissure. Their emphasized the difficulty involved in removing fissure contents using pumice and acid etching.[48]

Masato Futatsuki (1995) in a clinical and a SEM study evaluated the early loss of pits and fissure sealant. They stated that the presence of prismless enamel might significantly influence sealant retention due to its limited porosity and penetrability following acid conditioning. They found that after acid etching, unetched areas were seen in and around pits and fissures. They

suggested that a mechanical preparation of the fissure would produce a fresh enamel surface porosity free from debris and prismless enamel.[49]

Ekstrand et al (1995) conducted the study to check the relationship between the external and histological features of progressive stages of caries. The material comprised 140 extracted maxillary third molars. The central fossa area was examined with a stereomicroscope (SM) (x16) and macroscopically (M) under standardized conditions after cleaning and air-drying. Signs of caries were classified using a detailed scoring system involving 12 (SM) and 8 (M) classification criteria, ranging from 'sound' to 'cavitation with dentine involvement'. Six radiographic scores were used in the classification. Sections 250 microns in thickness were cut in buccolingual direction through the central fossa, and the fossa section with the most extensive stereomicroscopic changes was selected for histologic examination (x16). The histologic enamel and dentine changes were classified independently using 9 and 7 scores, respectively. The correlation between SM and the histologic enamel changes (HE scores) in terms of progressive demineralization and destruction were highly correlated (rs = 0.90). Dentinal changes were also highly correlated with enamel changes (rs = 0.85). The histologic classifications in conjunction with the macroscopical observations made it possible to demonstrate a clear relationship between the external degree of caries progression and the internal enamel and dentine reactions.

The data did not support routine usage of radiographic examination for occlusal caries diagnosis.[50]

Ferreira zandona AG et al (1998) conducted study to check the demineralization in pit and fissure it has been demonstrated that when excited by laser light carious enamel appears dark compared to luminescent sound enamel. The aim of this study was to compare the sensitivity and specificity of visual exams (V), laser fluorescence (LF) and dye-enhanced LF (DELF) for detecting demineralization in occlusal pits and fissures. The actual presence of lesions was determined by subsequent confocal laser microscopy (CM), which was compared to histology (H). Independent clinical examiners visually graded three sites on occlusal surfaces of extracted, human premolars as sound or carious and also rated the colour of each graded site as: 0 = same as surrounding enamel; 1 = white; 2 = light brown, or 3 = brown/dark brown. An argon laser was used to illuminate the teeth for LF and DELF; the images were captured with a CCD camera and then analyzed. DELF images were captured after the teeth had been exposed to 0.075% sodium fluorescein. Sections were then cut from each specimen and analyzed by CM and H for the presence or absence of caries. Results showed that DELF (0.72) was significantly more sensitive ($p<0.05$) than LF (0.49) and V (0.03) for detecting caries, but there were no significant differences among the methods in specificity (V 1.00; LF 0.67; DELF 0.60). When colour was used as an indication of caries in

V (VC, sensitivity 0.47; specificity 0.70), V exams were not different from LF. The area under the ROC curve, using H as the gold standard and CM as the test, was 0.78. Results indicated that DELF was the best diagnostic tool and that VC and LF were equally effective as diagnostic methods, when colour of fissures was included as an indication of demineralization in the visual exam.[51]

Mass E et al (1999) studying the effect of sealant on the presence of S.mutans in situ found that sealing caused a significant reduction in S.mutans levels on the treated occlusal surfaces , which lasted ,in most cases, up to six months . They suggested that sealants enable a prolonged reduction of S. mutans presence in situ, indicating an additional prevention effect, by eliminating some of the cariogenic bacterial reservoirs from the oral cavity.[52]

Irinoda et al (2000) investigated the effect of viscosity on the penetration of sealants into etched enamel by morphological observation of the resin infiltrated enamel at the enamel sealant interface sixty unerupted lower first premolars extracted from patients for orthodontic reasons were thoroughly cleaned A. "WINDOW" on the occlusal of 15 of the premolars, including both mesial and distal pits, was developed by painting nail varnish around the border of the occlusal surfaces. Etching was then done with 35% phosphoric acid for 60 sec to all 60 premolars. Five window teeth were evaluated by microradiography to determine the etching depth of the

superficial and subsurface enamel. Five were prepared for SEM analysis to observe the change of the superficial etched enamel surface. Another five window teeth were embedded in epoxy resin and sectioned parallel to the long axis of the tooth through the fissures in order to observe the subsurface depth of the etch SEM analysis. The other 45 teeth were divided into three groups of 15 teeth each. Fissures of each group of teeth were sealed using prism – shield and concise white sealant or teethmate a sealants. They were then sectioned and demineralized before being examined by a scanning electron microscope. Photographs of secondary electron image (SEI) were done to graduate the resin – infiltrated enamel and resin tags for these sealants. After SEM observation the 15 sample of each applied sealant were polished to a high gloss again and placed in a silver nitrate solution for 24 hours before being examination under the SEM equipped with back – scatter electron detector. Results showed that fissured enamel of unerupted human lower first premolars became porous after etching with 35 % phosphoric acid. The low viscosity sealant teethmate penetrated fully and formed a resin – infiltrated layer in enamel beyond the etched depth, when compared to the high viscosity sealants. They also stated that the resin infiltrated enamel and resin tags might be able to offer adequate protection in the event of sealant loss.[53]

Hassal et al (2001) states the fissure system be opened up (enamel/fissure biopsy) with a tungsten carbide long pear. This is basically to

determine whether caries is wide spread. All suspicious fissures are involved in the preparation. He considers the success rate for sealant restoration are comparable to those of amalgam restoration but with an advantage that they are less invasive and hence sound tooth is not removed . He also advocates the usage of glass ionomers to compensate for the problem faced with resin based sealant, such as marginal shrinkage and recurrent caries.[54]

El-Housseiny A, Jamjoum H(2002) This study aimed at disclosing a correlation between length of experience by the dentist and accuracy of caries diagnosis, by traditional clinical technique, that included visual and explorer examination, and evaluating the accuracy of the DIAGNOdent laser device. Histological sections confirmed clinical data obtained. Results showed that a reverse relationship between length of experience and accuracy of caries diagnosis i.e. younger dentist could achieve more accurate diagnosis. Laser diagnosis was superior to clinical diagnosis, whether by vision or explorer. It is concluded that DIAGNOdent laser is a promising instrument that can represent a valuable contribution to the dental practice.[55]

Fabiano bassalobre Valera (2005) Conducted a study to morphometric analysis of the occlusal surface; the influence on the prevalence of carious lesion. The aim of the study was to test the two null hypothesis 1) There is no morphological difference between molars and premolars in relation to the presence of pits and fissure and 2) there is no positive relation

to the presence of pits and fissures and the prevalence of carious lesion. Twenty two human teeth were used in the study which were sectioned and evaluated for the presence of pits and fissures and the prevalence of carious lesions. The results showed that there were no difference between molars and premolars regarding to the presence of pits and fissures and in general a prevalence of 22.5 % of pits and fissures. There was carious lesion in 92 % of the pits and fissures and in 34 % of the grooves and fossae areas.[56]

James B.Selecman*et al* (2007) conducted a invitro study the effect of preparation technique, fissure morphology, and material characteristics on the in vitro margin permeability and penetrability of pits and fissure sealants. A total of 100 extracted permanent molars were randomly assigned to 10 groups that combined the materials and preparation technique. Following the placement of the specimen were subjected for dye immersion , sectioned for microscopic examination and results showed that fissure morphology was not a significant factor regarding micro leakage, significant impact was there with sealant penetration with u type displaying high values. They also twenty – nine percent of the specimen showed U type of fissure with V,Y^1, and Y^2 fissure respectively.[57]

Grewal N, chopra R (2008) his study was designed to examine the effect of fissure morphology on penetration and adaptation of fissure sealants and their relationship with the eruption time of tooth One hundred and fifty

extracted molars and premolars were divided into two groups on the basis of their eruption time. The two groups were further divided into five subgroups on the basis of fissure morphology. An scanning electron microscopic analysis of penetration and adaptation of sealant was done. V- and U-shaped fissures were found to have the maximum penetration. Penetration was very poor for I- and IK-types of fissures. No significant difference in penetration was found in relation to eruption time. Adaptation of sealant was not affected by any of the factors. Concluded that Even the well-applied sealant does not necessarily provide complete obturation of pits and fissures, thus necessitating periodical clinical observation to determine the success or potential failure of the sealant treatment.[58]

Asma – al- jobair (2013) conducted a study to check the sealant penetration and adaptation in contaminated fissures through scanning electron microscope. Totally 56 teeth were taken in the study randomly divided into eight groups and the treatments were assigned accordingly .The sealants used were glass ionomer fissure sealant and resin – based fissure sealant. Then the conditioning like dry – conditioning, water contamination, saliva contamination or saliva contamination and air – drying. Penetration depth and the fissure types were evaluated. The micromorphological types of fissure were classified as 1)U type 2)V-type 3)Y1 – type 4)Y2 –type. They combined

U and V type as wide and shallow fissure and Y1 and Y2 were together combined as narrow and deep fissure.[59]

Richa Khanna et al (2015) conducted a study to check the morphology of pits and fissures reviewed through scanning electron microscope. Human permanent posterior teeth with intact occlusal surface were collected stored in 10% neutral formalin. Teeth were embedded in self cure acrylic resin blocks, cleaned with pumice slurry with bristle brush in slow speed hand piece. Teeth were divided into two groups 1) 10 teeth – for checking occlusal aspect of the fissure 2) 20 – teeth for examination of vertical aspect (depth) of the fissure. Samples were again divided into 10 teeth –no sealant application and 10 – teeth with sealant application .Both the subgroup teeth were slit longitudinally through the fissures with water cooled diamond blade creating sections of 1 to 1.5 mm thickness and dimensions no more than 2mm by 2mm length. Specimens were cleaned examined under scanning electron microscope and observation were recorded. Group 1 revealed the complex anatomy of the fissure system from the occlusal aspect with its numerous ramification. Group 2 revealed longitudinal depths of the fissure systems both with and without sealant reported the average distance of the base of the fissure from dentino- enamel junction was found to be 0.54 mm.[60]

Materials & Methods

MATERIALS AND METHODS

This study was conducted in Ragas Dental College and Hospital, Department of Paedodontics and Preventive Dentistry, in collaboration with the Department of Oral Pathology to assess the occlusal morphology of pits and fissure in molar primary teeth.

Armamentarium:

- 100 extracted or normally exfoliated primary first and second upper and lower molar teeth
- Saline
- Disposable mask and gloves
- Cotton
- Pumice slurry and polishing cups/ brushes
- Mouth mirror, Probe and Tweezer
- Carborundum disc and mantle
- Glass slide
- Cover slip
- Stereomicroscope

INCLUSION CRITERIA:

Extracted / exfoliated primary molar teeth with intact crown structure with or without root surface.

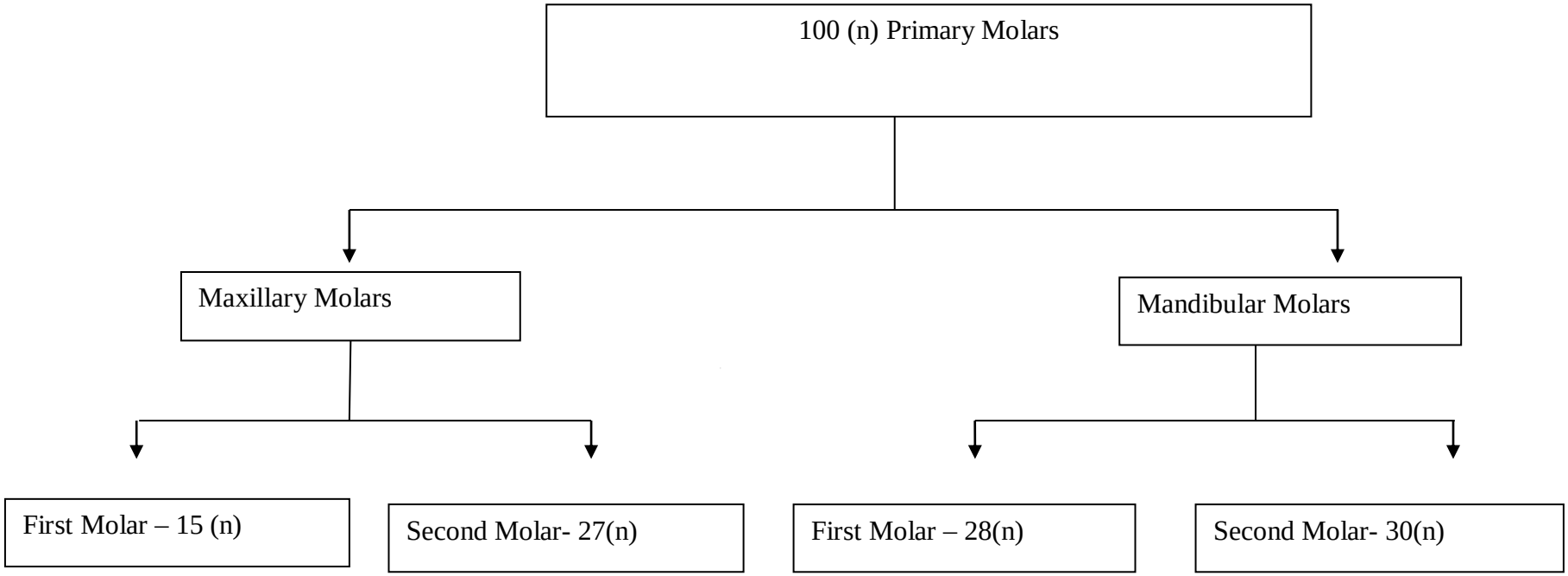
EXCLUSION CRITERIA:

Teeth with caries, fracture, crack and malformed teeth were excluded.

100 primary molars (maxillary and mandibular) were selected after thorough examination. The teeth were cleaned with a slurry of pumice, rubber polishing cups and then with water, preserved in neutral 10% formalin, until the time it was sectioned and examined under stereomicroscope.

The teeth were categorized as maxillary or mandibular according to their anatomical surface at the time of sample preparation.

Sample distribution table:-



SPECIMEN PREPARATION:-

The tooth was first sectioned longitudinally in a buccolingual direction with the water cooled carborundum disc. Then the serial sections were grounded and polished resulting in a final thickness of 40µm to 100µm. The prepared sections were mounted to the glass slide and cover slips were placed. The examination of the specimen and photomicrograph was carried out using stereomicroscope with 10 X magnification.

STATISTICAL ANALYSIS:-

The type of fissure patterns were recorded, tabulated and analyzed statistically.

Figures

Figure 1: 100 Primary Molar Teeth

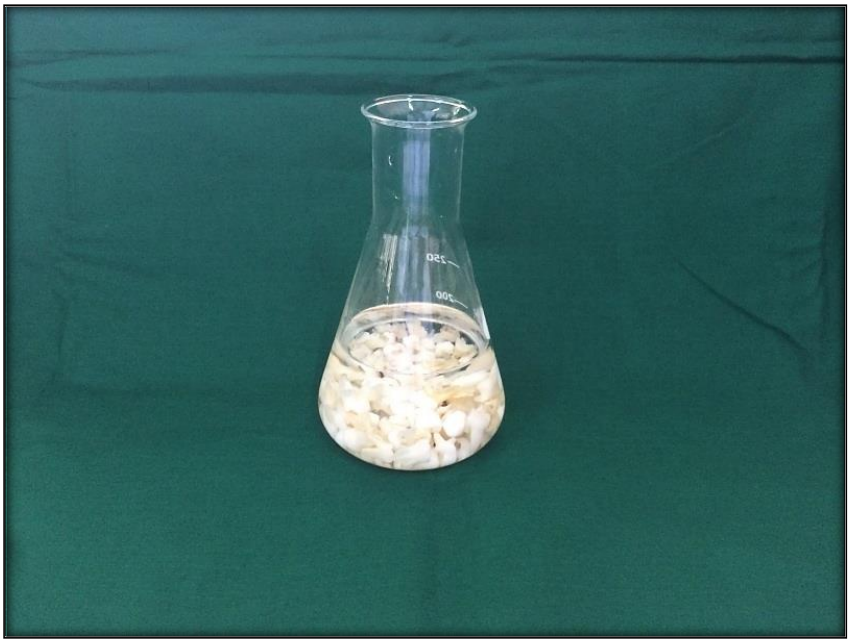


Figure 2: Armamentarium

Figure 3: Sections mounted on slides

Figure 4: Stereomicroscope

Figure 5: Maxillary Molar Teeth – V Shape Fissure Pattern

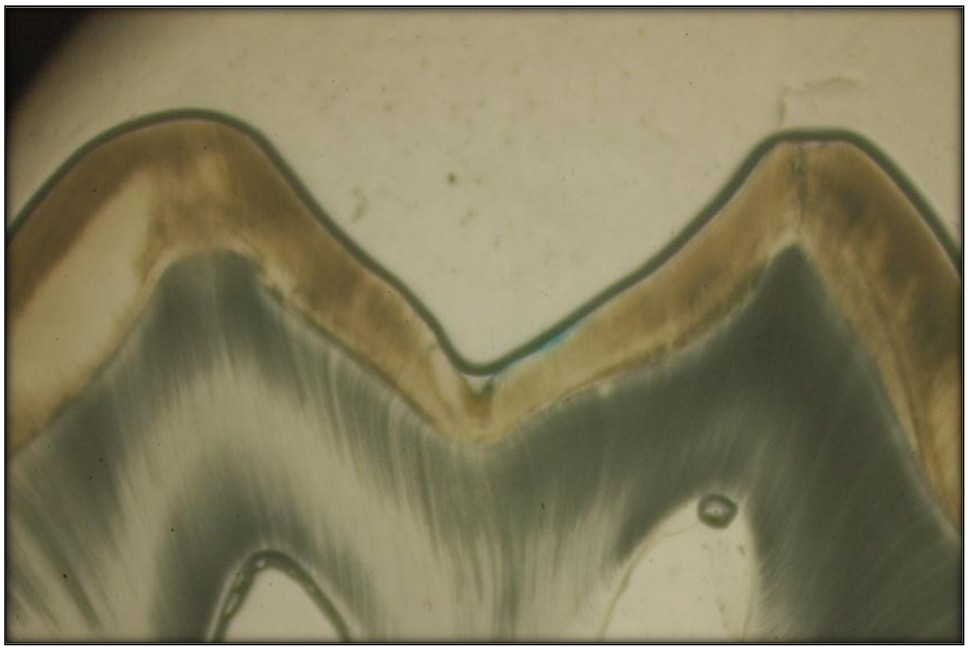


Figure 6: Mandibular Molar Teeth – U Shape Fissure Pattern

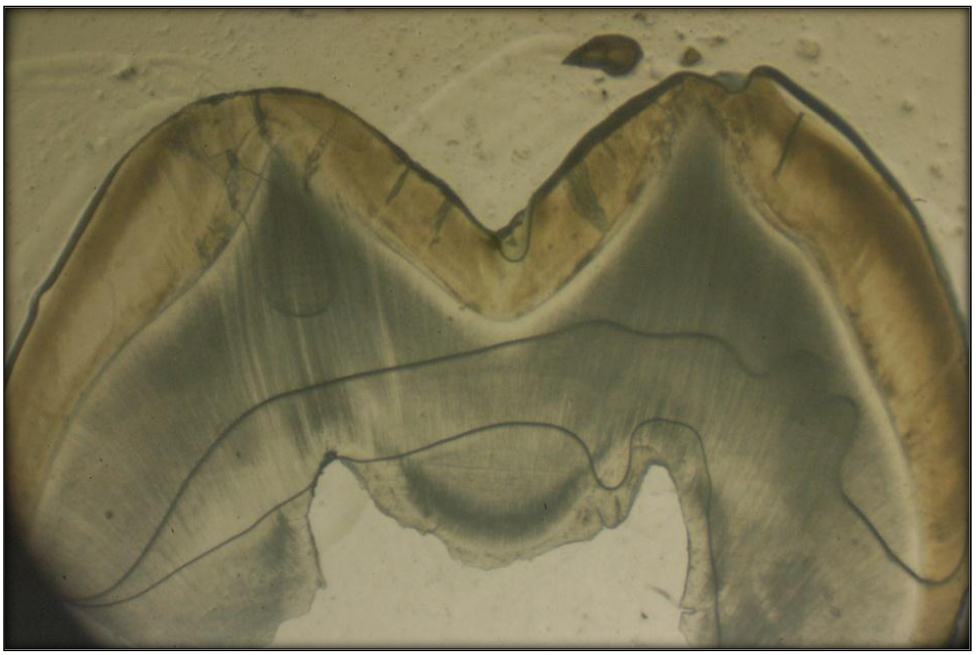


Figure 7: Linear Depression

Results

RESULTS

Table 1 shows the sample distribution that included 15 first primary maxillary molar and 27 second primary maxillary molar, 28 first primary mandibular molar and 30 second mandibular molar teeth. In this 56 (56 %) sections showed U- type of fissure pattern 37 (37%) sections showed V –type and 7 (7 %) sections showed other type of linear depression.

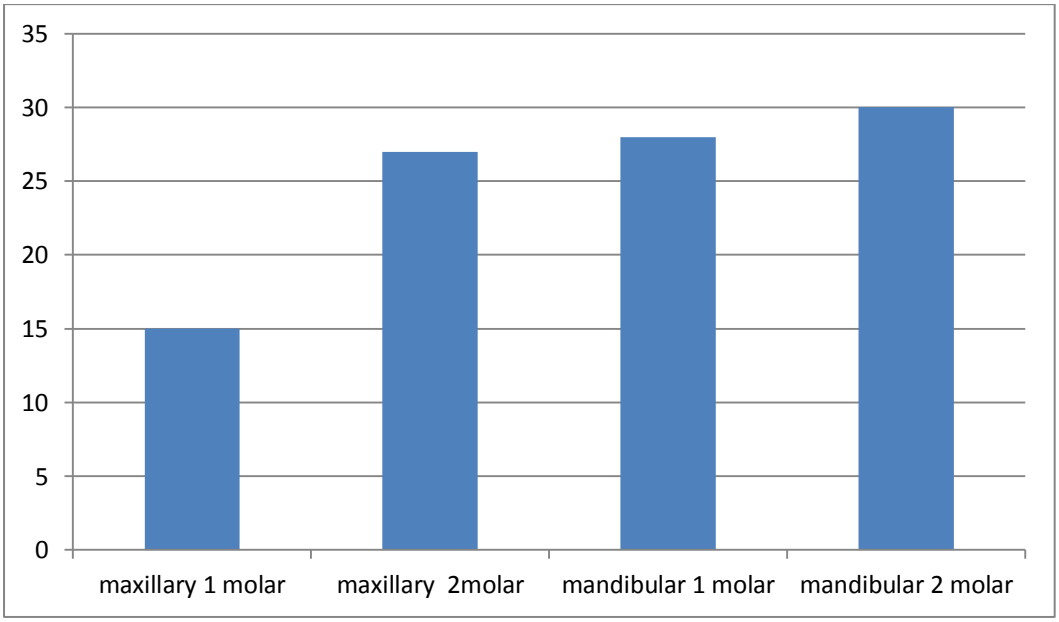
Table 2 shows fissure morphology where , U- type of fissure pattern was more prevalent in the mandibular molars whereas the U and V – type patterns were equidistributed in the maxillary molar sections. There was no significant difference in the distribution of type of fissure pattern between first and second molars ($P > 0.05$)*** or between maxillary and mandibular molar teeth ($P > 0.05$)*** when assessed with Fishers exact test .

Tables and Graphs

TABLE 1: SAMPLE DISTRIBUTION

	FIRST MOLAR	SECOND MOLAR
MAXILLARY DECIDUOUS MOLAR	**15(37.7%)**	**27(64.28%)**
MANDIBULAR DECIDUOUS MOLAR	**28 (48.2%)**	**30(51.7 %)**

GRAPH 1: SAMPLE DISTRIBUTION



- The fissure pattern was assessed by examining the section of 100 extracted deciduous teeth (42 upper and 58 lower first and second molars teeth).
- In maxillary teeth 15 (37.7 %) were first primary maxillary molar and 27 (64.28%) were second primary maxillary molar.

- In mandibular teeth, 28 (48.2 %) were first primary mandibular molar and 30 (51.7 %) were second mandibular molar teeth.

TABLE 2: OCCLUSAL FISSURE MORPHOLOGY OF DECIDUOUS MOLARS TEETH

	I - TYPE	**K- TYPE**	**U- TYPE**	**V- TYPE**	**OTHER TYPE**
MAXILLARY FIRST MOLAR	-	-	6 (40%)	7 (46.6 %)	2(13.3%)
MAXILLARY SECOND MOLAR	-	-	13(48.1%)	13(48.1%)	1(3.7%)
MANDIBULAR FIRST MOLAR	-	-	17(60.7%)	9(32.1%)	2(7.1%)
MANDIBULAR SECOND MOLAR	-	-	20(66.6%)	8(26.6%)	2(6.6%)
TOTAL	-	-	56	37	7

- **S**ix maxillary first primary molar (40%) showed U – type.
- Seven maxillary first molar (46.6%) showed V – type.
- Two maxillary first molar (13.3%) showed liner depression.
- Thirteen maxillary second molar (48.1%) showed U- type.
- Thirteen maxillary second molar (48.1%) showed V- type.
- One maxillary second molar (3.7%) showed linear depression.

- Seventeen mandibular first molar (60.7%) showed U- type.
- Nine mandibular first molar (32.1%) showed V- type.
- Two mandibular first molar (7.1%) showed linear depression.
- Twenty mandibular second (66.6%) showed U- type.
- Eight mandibular second (26.6%) showed V- type.
- Two mandibular second (6.6%) showed linear depression.

Discussion

DISCUSSION

Occlusal caries represents a major portion of the total caries experienced in children and adolescents.[47] It is a common belief that the higher caries susceptibility of occlusal surfaces, compared with smooth surface, is a direct result of the structural irregularities associated with occlusal pits and fissures (Newburn 1983, Nikifourk 1985).[61] Histological studies have demonstrated a relationship between the shapes of occlusal fissures and the localization, spread of dental caries (Nagano 1961, Konigs 1963, Mortier 1964, Mateeva1970).[9,47,56] Further observations by, konigs 1963, 1966 on serially sectioned teeth indicated that the initiation and localization of dental caries was related to the anatomical configuration of the occlusal surface.[12] However, certain discrepancies seem to exist regarding the differentiation between pits and fissures in fossae and grooves. According to Bodeker, controversy ensues mainly because of the misinterpretation of the terminology fissurea.[23]

Gillings and Buonocore in 1961 stated that the presence of pits and fissures is a normal occurrence and can be found in molars and premolars and are considered as areas with high susceptibility to caries lesion (Bossert 1933, Koing 1966, Juhl1983). [12 ,40,51,55,56] Hyatt in 1923 in his article stated that all fissures needs to be restored even before the onset of caries lesion aiming to prevent caries before its development.[25] Mortimer found an equal susceptibility to caries in wide and narrow fissure.[9] Konig on the other hand

described a higher susceptibility in deep and narrow fissure, whereas Zurhr and Vierus found that wide and V shaped fissures were more susceptible.[12,56]

Mondelli et al in 2002 agrees that grooves and the fossae are the natural anatomical details resulting from the coalescence of various developmental lobules, whereas fissures and pits are the deficient union among the lobules in the groove and in the fossae area.[62,41] There is also disagreement concerning the position of carious lesion in relation to fissure morphology. Mortimer and Gustafson found that the walls of the fissures are the first to become carious whereas Nagona and Konig have reported that the base was the first site of early carious lesion in wide fissures, and the walls were the first site in the narrow ones. Recent studies have revealed that fissure morphology is highly variable both within the individual tooth and between different teeth.[9,12,56]

Many authors have classified the pits and fissure according to the anatomical from in classes 1) V – type, ample in the top and gradually narrowing to the base 2) U- type almost the same width from top to base 3) I- type, a very narrow groove 4) IK- type, a very narrow groove associated to a large space in the base 5) other types being the V – type more prevalent (Nagona 1961).[10]

Valera in 2005 related the type of pits and fissure to depth in which the V – type have a superficial or shallow depth, the U- type have a average depth and most of the other types shows marked depth.[56]

According to Lussi -1991 and EKstrand et al in 1987 shallow fissure are those which have an inclination between cuspal slopes near the fissure entrance more than 90 degree, wide fissure which has inclination between cuspal slopes 90 degree or less, and narrow fissures are ones which had an inclination between the cuspal slopes less than 30 degrees.[46,47]

Wamnenmachers in 1962 classified fissures as funnel shaped, club shaped, deep cervical type, where as James in the year 2007 classified the fissures as U , V , Y1 and Y2 and all these classification were mostly for the permanent molar teeth.[63]

Galil and Gwinnett in 1975 and Marianne juhl in 1983 stated that the pit and fissure morphology are very complex especially in the molars teeth in the permanent dentition and classified the pits and fissures as either pointed, clubbed and rose – head. The Rose – head pattern was termed as 'dental bur configuration'.[38,41]

Most of these findings are based on the studies and observations done on the occlusal surface of permanent teeth and there exists very little literature for primary dentition.[35] Hence the present study was undertaken keeping the above facts in mind to assess the morphology of the occlusal surface of

deciduous molar teeth by examining the bucco- lingual serial sections of 100 primary first and second maxillary and mandibular teeth of the thickness 40µm to 100 µm under the stereomicroscope using 10 X magnification.

The fissure morphology examined in the present study showed predominantly U- shaped fissures (58%) and V – shaped fissures (42%) with the limited percentage of other type of fissure pattern (7%). Similar observation was noticed in the studies done by Mortimer in 1970, where U and V – type fissures were more prevalent in the primary teeth.[9] In the present study the V shaped fissures were more prevalent in maxillary molars where as U type fissure pattern was more prevalent in mandibular molars.

Previous literature often focused on the inaccessible occlusal fissures as vulnerable areas. Ekstrand, konig, carvalho study stated that caries initiation and development were independent of the anatomical configuration. In the fossa area the occlusal caries development is related to macro morphology of the fissure.[12,43,44] In deciduous teeth where U and V shaped fissure with only few deep invaginations were observed , the occlusal caries is quite common. This can be attributed to the other factors of caries etiology and difference between primary and permanent teeth morphology and histological properties like lower mineral content of the enamel, variation of enamel thickness throughout the fissure surface, cuspal inclination, the width, depth and shape of the fissure, width of the prism ranging from 4µm to 7µm compared to 6 µm

to 10 µm in permanent teeth and of the fissure access to the environmental changes.[9,35] A deep, narrow fissure may resist carious destruction, because a deep fissure too narrow to allow the impaction or even diffusion of considerable amounts of substrate, as seen in the I type seems to be less liable to carious attack than one providing a space for plaque and debris to accumulate.[34]

Studies showed that steepness of walls and ample space for the retention above the entrance to the fissure appear to be the most important features than the depth of the fissure proper, which is of secondary significance.[13]

Klaus G Konig suggested that the shallow fissure portion of grooves formed by walls joining under a wide angle of approximately 90 degree to 70 degree showed low susceptibility to decay, than in grooves formed by angles smaller than 70 degree, where initial decalcification of enamel was rather common and usually started at or near the deepest point of the sulcus. Similar finding were noticed by Gustafson and Nagano.[10,11,12.]

The present study confirmed the fact that the U and V shaped fissure pattern are predominant in the primary molars. However, the preventive measures should be aimed on the accurate assessment of risk associated factors with respect to the tooth surface, such as fissure depth, width, and enamel thickness overlying the fissures, cuspal inclination and the orientation of prism

structure in the primary teeth. Hence further studies are recommended to confirm the above parameters and its associated risk with development of dental caries.

Conclusion

CONCLUSION

1. U and V type of fissure pattern was more prevalent type in the primary molar teeth with few of them exhibiting linear depression pattern.
2. U – type of fissure was more predominant in mandibular molars.
3. U and V- type of fissure were seen with similar frequency in maxillary molars.
4. There was no significant difference in type of fissure pattern between first and second primary molars. ($p>0.05$)***
5. There was no significant difference between maxillary and mandibular molars.

Further study are recommended with bigger sample size to check the correlation between other risk associated factors of fissure morphology with caries initiation and progression.

Summary

SUMMARY

Dental caries is a wide spread multifactorial disease affecting both the deciduous and the permanent dentition. One among the multifactorial reasons for the development of the carious lesion is the tooth structure. Caries are usually initiated on the pits and fissure surface, smooth surface and on the root surface. Most of the caries are seen on the occlusal surface of the posterior teeth, where pits and fissure pave the way for the plaque accumulation and initiation of demineralization to take place, leading to a frank cavitation causing carious lesion. Since pits and fissure play a vital role in the caries progression many authors have re- evaluated the patterns in the molar teeth in the past.

Nagona in the year 1961, was the first to describe the fissure pattern in the permanent dentition and classified them as V- type 34 %, IK-type 26 %, I- type 19 %, U- type 14 % and other as 7 %, following this many authors have conducted studies to re – evaluate the fissure pattern in the permanent teeth and the various histological reasons behind the carious lesion in the permanent teeth. In 1970 Mortimer in his study evaluated the reasons for the caries progression in the deciduous molars. He showed that most of the deciduous molars had a U- type or V- type of fissure pattern. However there is limited literature available regarding the prevalence of occlusal morphology and fissure pattern in the deciduous molar teeth since then.

Hence this present study was undertaken to re- evaluate the fissure pattern in the deciduous molars. 100 primary maxillary and the mandibular first and the second molars were taken, preserved with neutral 10% formalin, sectioned, mounted on the glass slide and the fissure patterns were observed through stereomicroscope with 10X magnification using photomicrograph.

The mean was calculated and statistically analyzed with chi square and Fishers exact test.

The present study found that most of the deciduous molars exhibited U and V type pattern. The U type was more predominant in mandibular molar and the U and V type were equally prevalent in maxillary molars.

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Annexure

ANNEXURE-I

RAGAS DENTAL COLLEGE & HOSPITAL
(Unit of Ragas Educational Society)
Recognized by the Dental Council of India, New Delhi
Affiliated to The Tamilnadu Dr. M.G.R. Medical University, Chennai
2/102, East Coast Road, Uthandi, Chennai - 600 119. INDIA.
Tele : (044) 24530002, 24530003-06. Principal (Dir) 24530001 Fax : (044) 24530009

TO WHOM SO EVER IT MAY CONCERN

Date: 22-06-2015
Place: Chennai

From
The Institutional Review Board,
Ragas Dental College & Hospital,
Uthandi,
Chennai – 600119.

The thesis topic "**ASSESSMENT OF OCCLUSAL FISSURE MORPHOLOGY IN DECIDUOUS MOLAR TEETH"** submitted by **Dr.K.DEEBIGA** has been approved by the Institutional Review Board of Ragas Dental College & Hospital on 22nd June, 2015.

(Dr. N.S. AZHAGARASAN, M.D.S.,)
Secretary, Institutional Review Board,
Head of the Institution,
Ragas Dental College & Hospital,
Uthandi,
Chennai – 600119.

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